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# Biotechnology Notes

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Biotechnology Notes, a compilation of agency activities, news events, and upcoming meetings, is prepared for members of the U.S. Department of Agriculture's (USDA) Committee on Biotechnology in Agriculture by USDA's Office of Agricultural Biotechnology (OAB).

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## INSIDE USDA

### HOW TO OUTSMART A DROUGHT

Droughts and other natural disasters can have a very humbling effect on farmers, producers, and consumers alike. But to a certain group of researchers, coping with a drought means finding new uses for biotechnology. At Michigan State University, for example, scientists are hard at work analyzing a compound called betaine. Betaine accumulates in stressed plants, such as those experiencing drought, and is believed to act as a protector for the plant. The scientists have identified where betaine is synthesized and are now trying to isolate specific genes. The next step would be to clone the genes and transfer them into the plants.

Another team at the University of Nevada is looking at how plants under drought conditions change their photosynthesis processes in order to survive. The goal is to one day develop plants with normal rates of photosynthesis even under drought conditions.

Since plant growth slows down during a drought, another group of researchers at the University of Missouri is focusing on how roots sense the amount of water in the soil and then communicate this information to shoots.

At the North Central Soil Conservation Research Laboratory in Minnesota, another team is studying the effect of water deficiency on different stages of corn kernel development. They hope to discover at what stage the ill effects of drought may still be reversible.

All of these studies are funded by the Cooperative State Research Service's (CSRS) Competitive Research Grants Office. The experiments are very new and initial results are still a few years away. Hopefully . . . so is the next drought.

### NOT SEEING THE FOREST FOR THE WEEDS

Weeds, the bane of every weekend gardener, may have finally met their match. Researchers at the Forest Service's North Central Forest Experiment Station, Forestry Services Laboratory, Rhinelander, Wisc., are using a tissue culture technique to cultivate herbicide-tolerant hybrid poplars. Initial results indicate that when the poplars and surrounding weeds are sprayed, only the weeds die.

The technique induces a natural mutation in the poplars that makes them tolerate even the most toxic levels of the herbicide compound. Pieces of a leaf are grown on an agar-based medium containing nutrients and a regulator that controls growth. Either new mutations that tolerate the herbicide or segments of a cell already mutant begin to develop. The mutations are separated from the rest of the growth and replaced at least three times on fresh, herbicide-rich agar. The survivors are then moved to a greenhouse, rooted, and sprayed again. Next spring, the hardiest of them all will be sprayed once more in outdoor field plots.

A patent is pending on both this technique and another using cell suspension. Both single cells and small groups of cells are agar cultivated. Certain clumps of cells are regenerated using somatic embryogenesis. The new embryo mimics a seed's embryo. Using this technique, researchers can regenerate up to 100,000 new embryos at a time. Another advantage is these embryos produce a higher level of herbicide tolerance than through tissue culture variation. Plants regenerated from the cell suspension method will be tested in a greenhouse next spring.

The weed-killing herbicides used in the experiments are glyphosate (trade name "Roundup") and sulfometuron-methyl (trade name "Oust"). Neither herbicide, when used at recommended rates, is harmful to humans, animals, insects, or the environment.

#### STOP BUGGING ME!

On the one hand, the tobacco bud worm (which is really a moth) is just like other agricultural pests: it likes to eat and reproduce. Cotton and tobacco are its favorite foods. But unlike any other bug in the genus *Heliosis*, the bud worm has a unique genetic trait that, if harnessed, could lead to its own demise and the eradication of many other harmful pests that now cost American agriculture about one-half billion dollars a year in lost production.

When the fertile male bud worm mates with a fertile female of another species, all male hybrids are born sterile. If this trait could be introduced into the wild, scientists may be able to suppress bud worm populations by reducing their ability to reproduce.

Fascinated with the prospect of transferring this trait to other pesky pests, researchers at the Agricultural Research Service's Insect Attractants, Behavior, and Basic Biology Research Station, Gainesville, Fla., have used recombinant DNA technology to clone the gene from the fertile male bud worm that they speculate may cause sterility in male progeny.

The gene closely resembles two others, one found in plants and the other in bacteria. Those plant and bacterial genes provide the blueprint for proteins which, in turn, assemble other proteins. With the availability of this cloned gene, it will now be possible to evaluate its role in inducing male sterility. The next step will be to introduce the gene into different insect pests, such as the infamous Mediterranean fruit fly.



## NEWS AND VIEWS AROUND THE COUNTRY

- North Carolina is studying the issue of implementing state regulations. According to the September issue of BT Catalyst, an advisory committee created by the North Carolina Biotechnology Center, will study whether the state should regulate plant bioechnology and what those regulations should encompass. In addition to reviewing current state and Federal regulations, members will also scrutinize environmental, ethical, economic, and public policy issues. The committee plans to meet every month until next summer, then pass its recommendations on to the state's General Assembly.
- According to the July-August issue of Wisconsin BioIssues, the state of Wisconsin supports the development of biotechnology in that state but it must be done in "harmony with the environment." Also, if Wisconsin needs any regulations, existing Federal rules will be used as a guidepost. Discussion of these issues by members of the Governor's Council on Biotechnology is ongoing and subject to change at upcoming meetings.
- Wisconsin BioIssues also reports BioTechnica International has asked the Environmental Protection Agency (EPA) for permission to stop its alfalfa-inoculant experiments in Pepin County, Wisc. and to destroy the plants. According to the company, the nitrogen-fixing bacteria, Rhizobium meliloti, are not having an effect and monthly soil sampling efforts have become very expensive.
- The Netherlands' first approved outdoor field test of a genetically engineered crop is now underway, according to Genetic Engineering Letter. Approval was granted to MOGEN International N.V., a Dutch biotechnology company, to plant 1,400 transgenic potato plants that have a built-in virus resistance. The new cultivar, Dutch Bintje, with the coat protein of the potato virus X, makes the plants tolerant to PVX. MOGEN received a Nuisance Act license before beginning the experiment. Although a Dutch environmental group requested suspension of the field trial, the State Council of the Netherlands rejected the request.
- The International Food Biotechnology Council (IFBC), comprised of more than 30 biotech and food processing companies, was created in February 1988 to tackle the tough issues surrounding the safety of foods developed through biotechnology processes. The Council has met several times over the last few months and held one workshop. Three subcommittees have been formed to analyze scientific issues, public relations, and legal/regulatory requirements and to recommend guidelines if they are needed. Experts from academia and the public sector will be called on as advisors in specific subject areas. For more information about IFBC, contact Dr. Alan Goldhammer, Director of Technical Affairs, Industrial Biotechnology Association, 1625 K St., N.W., Suite 1100, Washington, D.C. 20006, or call (202) 857-0244.

## IN CASE YOU WEREN'T THERE

- Historic Annapolis, Md., on the banks of the Chesapeake Bay, was the site for the first USDA-EPA-FDA-sponsored conference on transgenic plants, held Sept. 7-9. About 150 scientists, industry and public interest representatives, government regulators, and attorneys discussed types of transgenic plants, laboratory techniques, transformation systems, human health concerns, and environmental issues.



Keynote speaker Dr. Kenneth Gilles, USDA's Assistant Secretary for Marketing and Inspection Service, noted this tri-agency sponsored meeting was evidence of the cooperation that exists in the Federal sector on matters pertaining to biotechnology.

An industry representative said the private sector has taken the lead in biotechnology research and development, mainly because of its commitment to meet customer needs. In the next five years, the big push will focus on using single rather than multiple genes to improve resistance to insects, diseases, and herbicides. Industry hopes the genetically engineered tomato will reach full-scale agricultural production in five years. Major constraints include undesired somoclonal variations, inadequate methods for evaluating the nutritional value of new food products, the public's perception of safety, and regulatory controls.

An environmental spokesperson didn't see a problem with transgenic plants, but would like more integration of biotechnology techniques with those used in biocontrol and integrated pest management practices. Another speaker, however, said she feared for the extinction of species, drastic changes in the ecosystem, the inability to recall a released organism, and the prospect of expensive clean-ups. Both speakers felt the public rather than the private sector should be responsible for research projects that affect the public good.

- The conference on biotechnology in the Pacific Rim, Sept. 5-9, in Singapore, focused on the research, development, and regulatory programs of Singapore, the Republic of China, the Republic of Korea, and the United States. These countries, except for Singapore, wish to encourage U.S. firms to relocate to their areas or engage in joint ventures. Regulations and biosafety concerns were not considered to be significant issues.

In addition to this conference, the two USDA attendees, Don King of CSRS and Fred Kuchler on detail to OAB from the Economic Research Service, visited Japan. The Japanese had a thorough knowledge of biotechnology activities at the Food and Drug Administration, the National Institutes of Health, USDA's Animal and Plant Health Inspection Service, and the Food Safety and Inspection Service. They knew less about EPA and requested more information on intellectual property rights. The Japanese also said they are in the process of developing "guidelines," which appear to be comparable to USDA regulations. It appears all of these countries in the Pacific Rim are concentrating their biotechnology efforts on marketing and manufacturing rather than research.

- USDA's Agricultural Biotechnology Research Advisory Committee (ABRAC) met Sept. 22-23 in Washington, D.C., to discuss proposed guidelines for biotechnology research and another document on field testing. ABRAC members proposed several changes to the field testing document, including reorganizing chapters and renaming the title. Members formed three working groups to discuss confinement levels and the classification of experiments and organisms. Although the full committee does not convene again until Jan. 5-6, a smaller working group may meet sooner to discuss the guidelines. A notice of that meeting would appear in the Federal Register.

#### NEW PUBLICATIONS

"Strategic Investments for Agricultural Research and Education," a 47-page report prepared by the National Association of State Universities and Land-Grant Colleges, describes FY 1990 priorities and levels of funding. Available by writing to Jim Cowan, NASULGC, 1 Dupont Circle, N.W., Suite 17, Washington, D.C. 20036-1191.

A new report by the National Research Council, an arm of the National Academy of Sciences, stresses the need for more "agricultural literacy" among students. "Beginning in kindergarten and continuing through 12th grade, all students should receive some systematic training in agriculture," according to the 17-member committee that produced the report. Understanding Agriculture: New Directions for Education may be obtained from the National Academy of Sciences, 2101 Constitution Ave., N.W., Washington, D.C. 20418, or call (202) 334-2138. It costs \$8.95 prepaid.

"BST: Continuing A Dairy Tradition," is the title of Monsanto's new 11-minute, half-inch video that discusses the nature, application, and economics of bovine somatotrophin. It may be borrowed by writing to: Venard Films, Box 1332, Peoria, Ill. 61654, or calling (309) 699-3911.

A Cartoon Guide to Genetics, a small paperback published in 1983, should now be well-stocked in national bookstores. This mildly amusing but very informative work gently guides the reader through complex scientific practices, such as genetic engineering. It also helps to debunk many myths about biotechnology. It is co-authored by Larry Gonick and Mark Wheelis, published by Barnes and Noble, and sells for \$6.95.

Understanding DNA and Gene Cloning: A Guide for the Curious, by Karl Drlica, is another easy read for the non-scientist. Published by John Wiley and Sons; sells for about \$10.

Regulating biotechnology, biotech's impact on U.S. competitiveness, and medical applications of biotechnology are the subjects of three new brochures available from the Industrial Biotechnology Association. To receive free copies, contact the Association at (202) 857-0244.

"Biotechnology in Agriculture" and "Strategic Alliances in Biotechnology" are two new reports published by Arthur D. Little Decision Resources. To order, call Jean Carbone at (617) 270-1222.

#### CALENDAR OF MEETINGS FOR OCTOBER

Oct. 3-5: Advances in rDNA Technology; Genetic Engineering and the Immune System. Incline Village, Nev. Contact: The Center for Advanced Training in Cell and Molecular Biology. The Catholic University of America, Washington, D.C. 20064.

Oct. 4-7: Biotek India '88. New Dehli. Contact: Convex Division of Applied Technology Services, 14F, Basant Lok, Vasant-Vihar, New Dehli, 110 057 India.

Oct. 11: "Biotechnology in the Pacific Rim -- Opportunities for U.S. Companies" will be the subject of a lecture given by author Dr. Robert Yuan at a free breakfast meeting sponsored by the North Carolina Biotechnology Center at Research Triangle Park, N.C. For details, call Jack Maczuga at (909) 541-9366.

October 13-14: "Positioning Agriculture for the 1990's: A New Decade of Change". Kansas City, Mo. Contact: Marianne Auinbauh at the Chamber of Commerce of Greater Kansas City at (816) 221-2424.

Oct. 17-19: International Symposium on Biotechnology and Food Quality. University of Maryland. College Park, Md. Contact: Dr. Shain-dow Kung; (301) 454-6056.



Oct. 18-20: The Bay Area International Biotechnology Expo. Oakland Convention Center, Calif. Contact: Cartlidge & Associates at (408) 554-6644.

Oct. 20: "Hiring and Retention Practices in Biotechnology Firms". Gaithersburg, Md. National Bureau of Standards. Contact: The Montgomery County High Technology Council at (301) 762-6325.

Oct. 23: First National Symposium on New Crops Research, Development, Economics. Indianapolis, Ind. Contact: Jules Janick, Department of Horticulture, Purdue University, West Lafayette, Ind. 47907, or call (317) 494-1329.

Oct. 27-30: Tour to Tropical Foliage Plant Nurseries. San Juan, Puerto Rico. Contact: Dr. L. J. Liu, O'Neill St., #133, Hato Rey, Puerto Rico 00917, or call (809) 767-4560. (Group rates available on airfare, hotel, and transportation.)

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Suggestions for items to include in future issues of Biotechnology Notes may be addressed to Marti Asner, U.S. Department of Agriculture, OAB, Room 321-A, Administration Bldg., 14th and Independence Ave., S.W., Washington, D.C. 20250, or call (202) 447-9165.





